

# TPC Project Plan from LLNL

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For Ron Soltz

# Preface

- (From Ron's email) I'm attaching a spreadsheet that Howard Wieman worked up for us at the LLNL meeting last year. It's as good a starting point as any for the sPHENIX TPC project.

Item	sub item	parts (\$)	labor (hrs)	labor (k\$)	rate \$/hr \$130
gas vessel/support cylinder					
Two carbon fiber cylinders with flanges	mandrels	\$40	320	\$41,600	
	bond fixtures	\$18,000	160	\$20,800	
	composit fabrication	\$10,000	480	\$62,400	
	procurement		80	\$10,400	
	testing	\$1,000	60	\$7,800	
	metrology		16	\$2,080	
	item sum	\$29,040		\$145,080	\$174,120
end caps					
two aluminum end caps with seals, insulating structures, high voltage distribution, feed throughs, mounting structures. <u>Note: this does not include GEMs or electronic feed throughs for the GEMS</u>	aluminum end caps	\$40,000			
	G10 assembly	\$10,000	480	\$62,400	
	Assembly fixtures	\$5,000	120	\$15,600	
	adjustable support mounts	\$8,000	40	\$5,200	
	procurement		80	\$10,400	
	metrology		16	\$2,080	
	testing		160	\$20,800	
	item sum	\$63,000		\$116,480	\$179,480
field cage					
Alice style field cage with support bars and stretched aluminized mylar tape, matched resistors, power supply, current and voltage monitoring instrumentation with spares for critical items.	support columns	\$5,000			
	mounting hardware	\$5,000			
	fixturing	\$5,000			
	resistor matching	\$200	40	\$5,200	
	assembly		240	\$31,200	
	power supply	\$10,000	40	\$5,200	
	instrumentation	\$10,000	120	\$15,600	
	procurement		80	\$10,400	
	metrology		24	\$3,120	
	testing		240	\$31,200	
	item sum	\$35,200		\$101,920	\$137,120
central membrane					
Stretched conductive kapton with support frame and high voltage cabling	frame	\$5,000			
	fixturing	\$5,000	40	\$5,200	
	cable	\$1,000	40	\$5,200	
	assembly		160	\$20,800	
	procurement		80	\$10,400	
	metrology		24	\$3,120	
	testing		16	\$2,080	
	item sum	\$11,000		\$46,800	\$57,800

Item	sub item	parts (\$)	labor (hrs)	labor (k\$)	rate \$/hr \$130
laser system					
STAR style laser system with two quadrupled NdYag lasers, optics distribution and mirror bundles	lasers	\$90,000	80	\$10,400	
	safety interlocks and paper work	\$2,000	200	\$26,000	
	optics with mounts	\$50,000	200	\$26,000	
	mirror bundles and supports	\$15,000	200	\$26,000	
	procurement		80	\$10,400	
	item sum	\$157,000		\$98,800	\$255,800
gas system					
STAR style gas system with recirculation, scrubbers, flow control, mass flow meters, mixture monitoring, oxygen and water sensors, interlocks and control	mass flow meters	\$9,000			
	gas analyzer, 2 for redundancy	\$60,000			
	scrubbers	\$4,000			
	oxygen and water sensors	\$4,000			
	computer control system	\$3,000	640	\$83,200	
	plumbing and assembly	\$7,000	640	\$83,200	
	interlocks	\$3,000	120	\$15,600	
	procurement		120	\$15,600	
	safety reviews and paper work		240	\$31,200	
	item sum	\$90,000		\$228,800	\$318,800
cooling system					
STAR style water cooling system for electronics and temperature control of the drift volume.	pumps	\$500			
	heat exchanger	\$4,000	80	\$10,400	
	PH control	\$2,000	80	\$10,400	
	end cap manifolds	\$20,000	160	\$20,800	
	tanks	\$2,000	80	\$10,400	
	plumbing	\$4,000	640	\$83,200	
	controls	\$3,000	120	\$15,600	
	interlocks	\$3,000	120	\$15,600	
	procurement		120	\$15,600	
	item sum	\$38,500		\$182,000	\$220,500
meetings and reviews					
weekly meetings plus periodic reviews with preparation	weekly meetings		1536	\$199,680	
	reviews		1280	\$166,400	
	item sum			\$366,080	\$366,080
total					\$1,709,700